Harmful Algal Blooms along the Alabama Gulf Coast

ADPH Responsibilities and Responses

Alabama HABs

Harmful algal blooms (HABs) are caused by phytoplankton, microscopic algae, or cyanobacteria that grow in huge numbers under the right conditions. These blooms can degrade water quality by lowering dissolved oxygen, cause damage to fish gills, or produce toxins affecting marine life and humans.

Alabama HABs- ADPH History

- Pre-1991
  - Jubilees
  - Fish kills
  - Investigated by Conservation, Dauphin Island Sea Lab and University of South Alabama
- 1988- FDA The FDA required states to develop a biotoxin contengency plan for managing HAB in shellfish growing areas.
  - The plan requires monitoring for HAB and actions to close shellfish growing areas that are affected.
- 1991
  - Alabama Department of Public Health sent two Bureau of Clinical Laboratories microbiologists to Florida's Marine Research Institute for HAB training
- 1996
  - The first documented *Karenia brevis* (*Gymnodinium breve*) HAB affected beaches and closed AL shellfish growing areas to harvest for weeks.

Alabama HABs- ADPH History

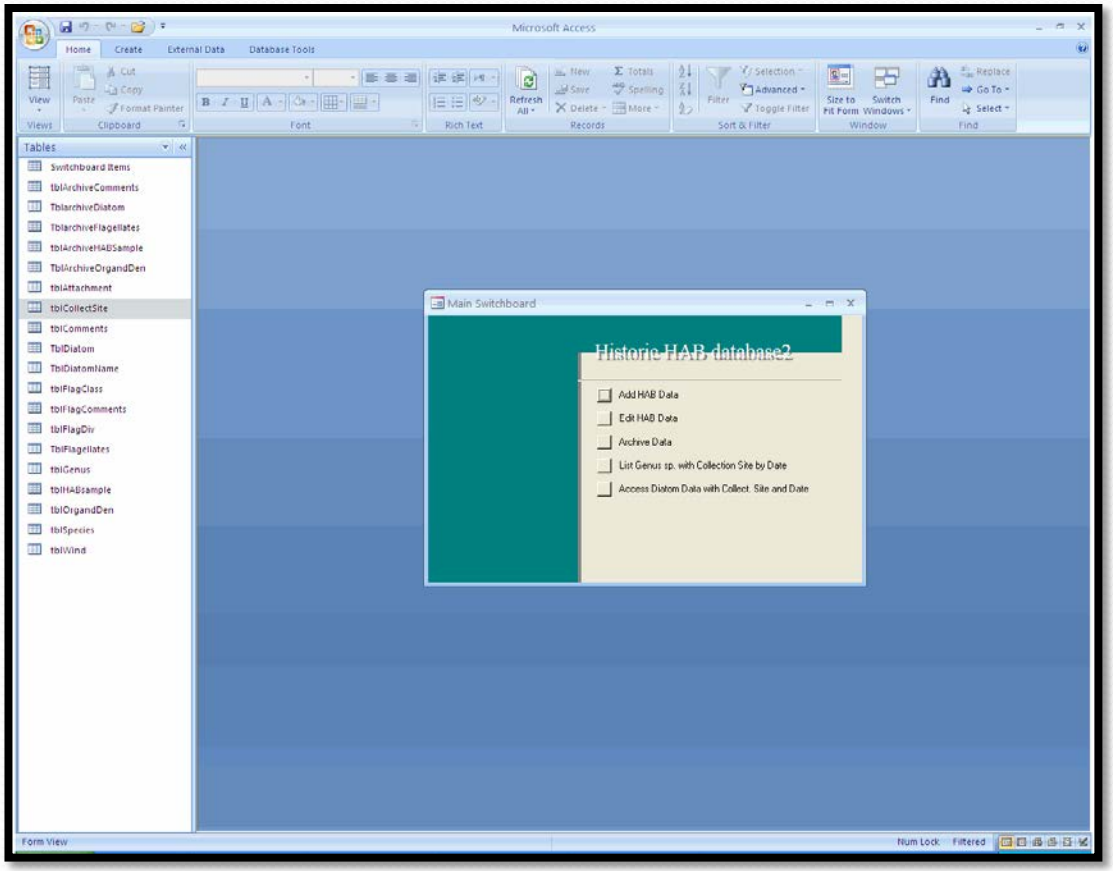
- 2000
  - *Karenia brevis* bloom near shore and of short duration
- 2004
  - *Pseudo-nitzschia* spp bloom with low level domoic acid production.
- 2007
  - *Karenia brevis* bloom affecting beaches and shellfish growing areas
  - *Pyrodinium bahamense* bloom in Portersville Bay. Toxin was present, but not at actionable levels in shellfish meats.
  - *Karlodinium veneficum* bloom in Weeks Bay caused fish kills. Toxins from this strain are 10 X more toxic than previously studied strains on the east coast of the US.

Alabama HABs- ADPH History

- 2009
  - *Pseudo-nitzschia* spp bloom in Mississippi shellfish growing areas. Toxin levels in shellfish meats were below actionable levels.
- 2013
  - *Pseudo-nitzschia* spp bloom in Alabama shellfish growing areas. Toxin levels in shellfish meats were detectable but below actionable levels.
- 2015
  - *Karenia brevis* near shore bloom that caused respiratory problems for beach goers, shellfish growing area closures, and marine mammal morbidities currently under study.

Alabama HABs

The Mobile Lab has electronic phytoplankton sample records dating to our first well documented red tide event in 1995.

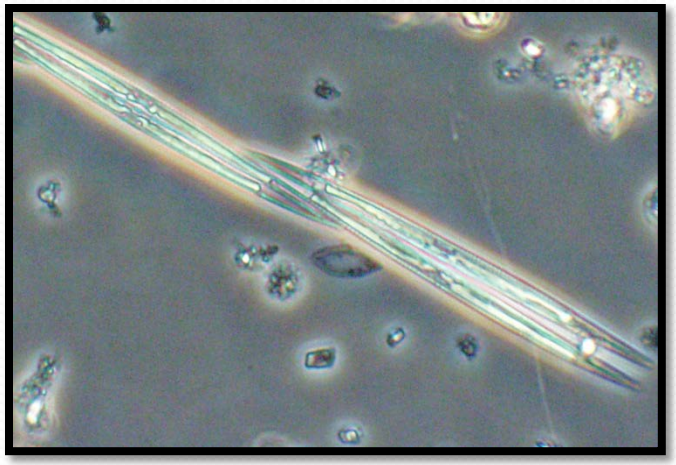


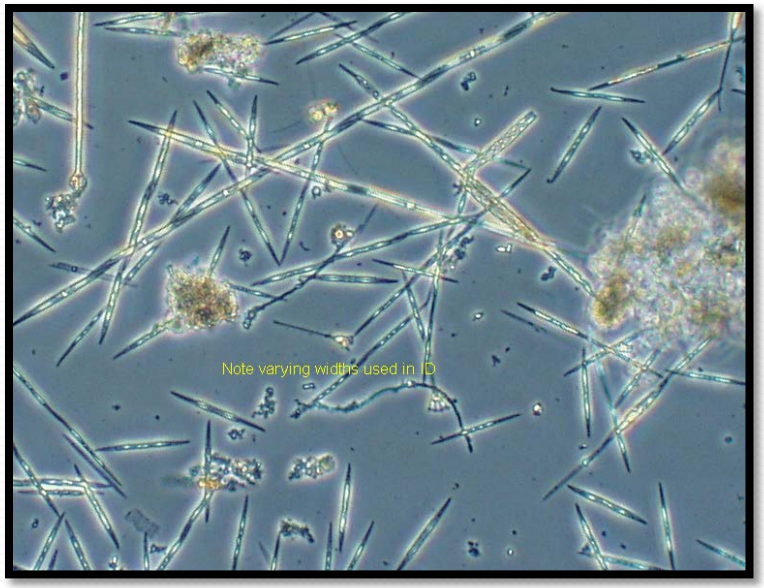
Alabama HABs

- The major harmful algal blooms seen along our northern Gulf Coast include
- Karenia brevis, dinoflagellate
  - Neurotoxic Shellfish Poisoning

Alabama HABs

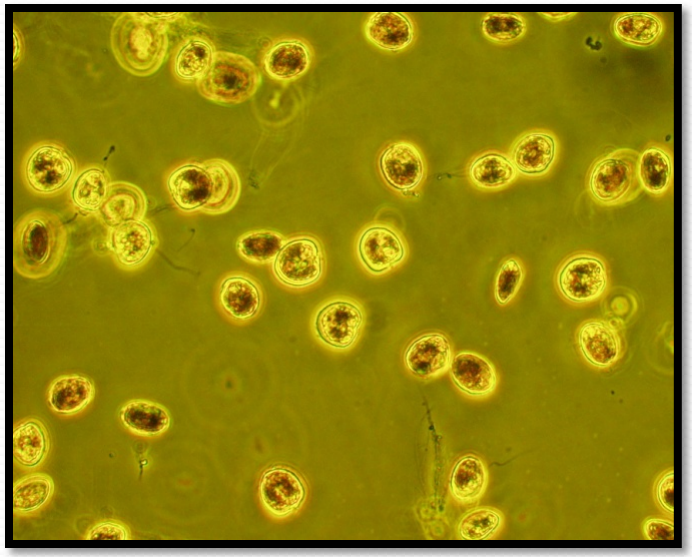
- The major harmful algal blooms seen along our northern Gulf Coast include
- Pseudo-nitzschia, diatom
  - Amnesiac Shellfish Poisoning

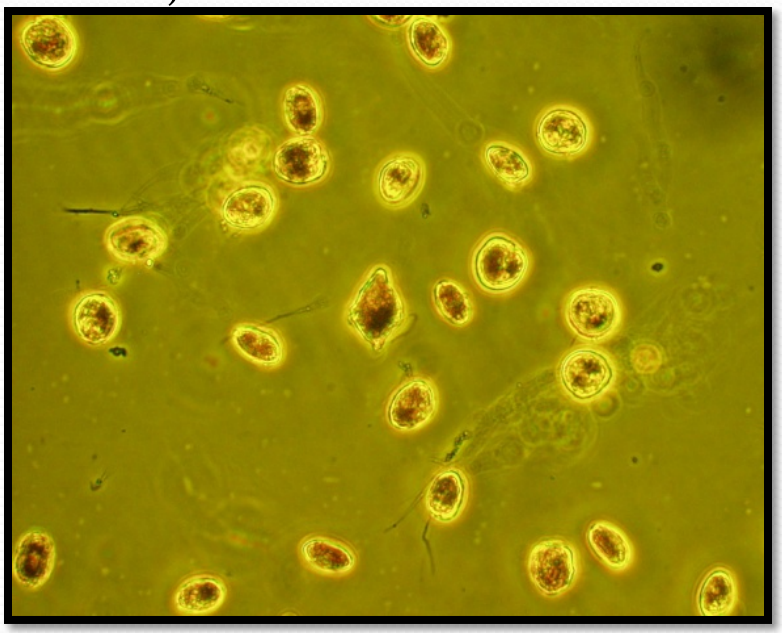




Alabama HABs

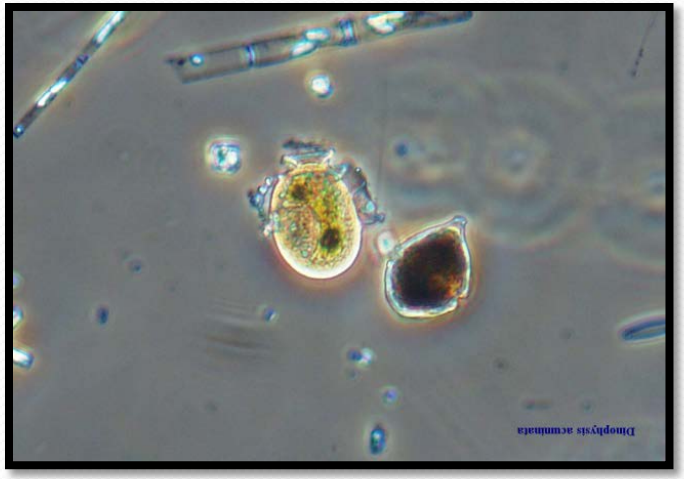
- The major harmful algal blooms seen along our northern Gulf Coast include
  - Prorocentrum minimum, dinoflagellate
    - Taste and odor problems in shellfish; aesthetics

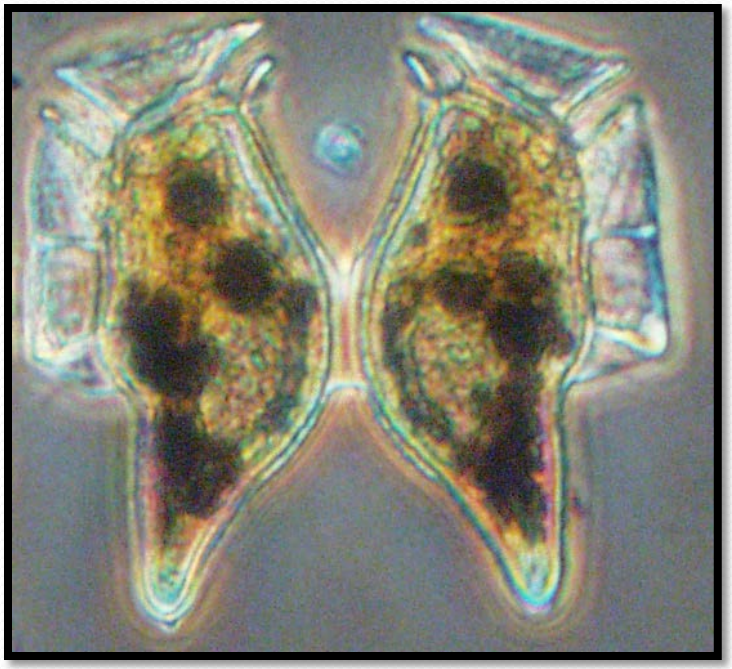




Alabama HABs

- The major harmful algal blooms seen along our northern Gulf Coast include
  - Dinophysis spp.
    - Diarrheic Shellfish Poisoning





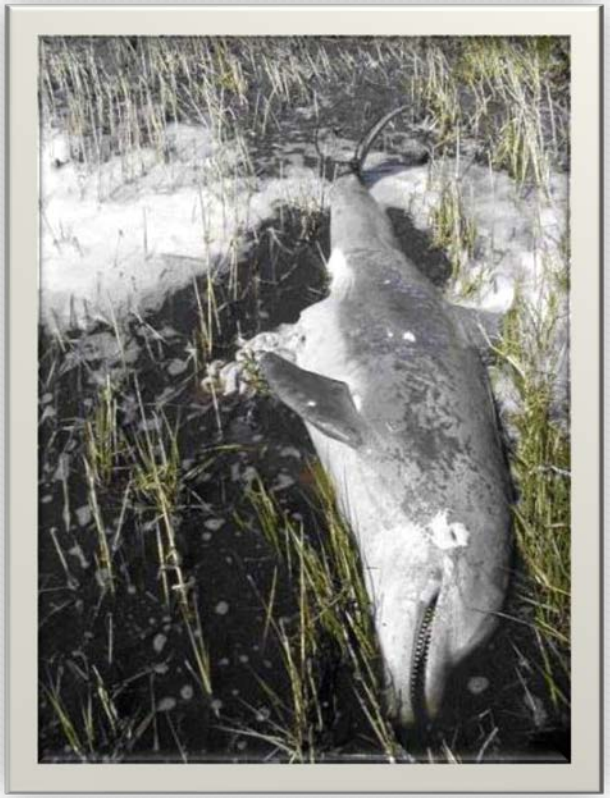
Alabama HABs

- The major harmful algal blooms seen along our northern Gulf Coast create dramatic scenes in our waters by causing fish kills and areas of discolored water.

Alabama HABs

- Marine Mammals

Manatees moving through bloom areas in November and December, 2015



Dolphins accumulate toxins through feeding.

Alabama HABs

- The harmful algal blooms seen along our northern Gulf Coast threaten the shellfish industry with
  - Neurotoxic Shellfish Poisoning
  - Amnesiac Shellfish Poisoning
  - Taste and odor problems
  - Diarrheic Shellfish Poisoning

Alabama HABs

- Toxins can be detected and quantified using chemical and biological methods in qualified laboratories.

Alabama HABs

- Toxin testing
  - Mouse Bioassay
  - HPLC- High Pressure Liquid Chromotography
  - LCMS- Liquid Chromotography- Mass Spectrometry
  - ELISA- Enzyme Linked Immuno Assay
  - Receptor Binding Assay

Alabama HABs

- Toxin testing
  - Some toxins require a biological test environment because the natural reaction is a combination of toxins and the metabolites from processes within the living organism.

Alabama HABs

- The ADPH HAB Response Plan

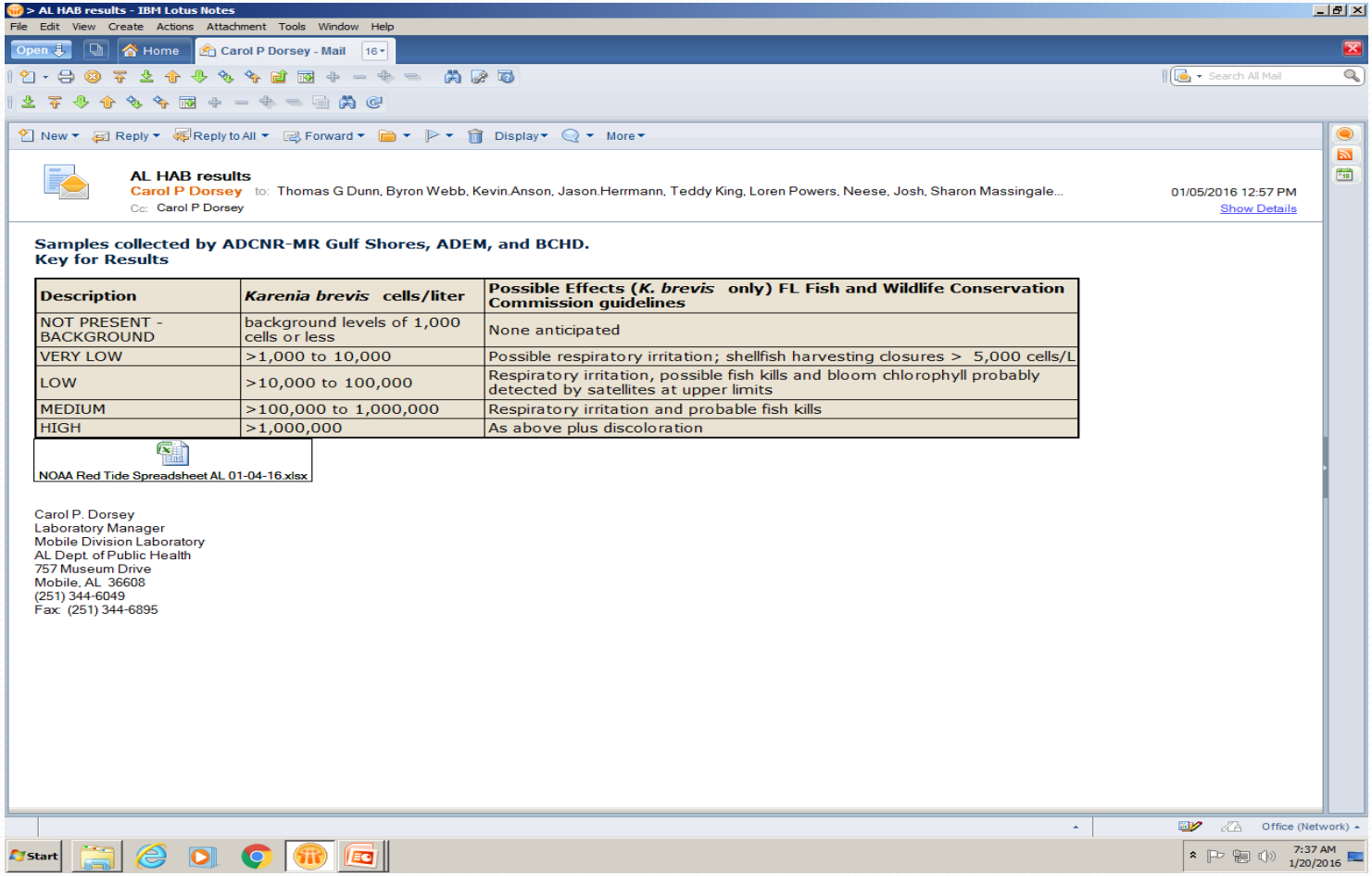
  A compilation of agencies and actions used during a bloom to improve reporting, sample scheduling, and understanding of roles after the 2007 Karenia brevis bloom. This plan was useful in the 2015-2016 bloom.

Alabama HABs Partners

- Agencies involved with the *Karenia brevis* bloom of 2015-2016
  - NOAA
  - ADCNR-Marine Resources
  - Dauphin Island Sea Lab
  - FDA Seafood Research Lab
  - ADPH
  - ADEM

Alabama HABs Lab

Lab Results Summary sent to partners and NOAA



> AL HAB results - IBM Lotus Notes

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Open Home Carol P Dorsey - Mail 16

New Reply Reply to All Forward Display More

AL HAB results

Carol P Dorsey to: Thomas G Dunn, Byron Webb, Kevin.Anson, Jason.Herrmann, Teddy King, Loren Powers, Neese, Josh, Sharon Massingale...

Cc: Carol P Dorsey

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Show Details

Samples collected by ADCNR-MR Gulf Shores, ADEM, and BCHD.
Key for Results

Description	*Karenia brevis* cells/liter	Possible Effects (*K. brevis* only) FL Fish and Wildlife Conservation Commission guidelines
NOT PRESENT - BACKGROUND	background levels of 1,000 cells or less	None anticipated
VERY LOW	>1,000 to 10,000	Possible respiratory irritation; shellfish harvesting closures > 5,000 cells/L
LOW	>10,000 to 100,000	Respiratory irritation, possible fish kills and bloom chlorophyll probably detected by satellites at upper limits
MEDIUM	>100,000 to 1,000,000	Respiratory irritation and probable fish kills
HIGH	>1,000,000	As above plus discoloration

NOAA Red Tide Spreadsheet AL 01-04-16.xlsx

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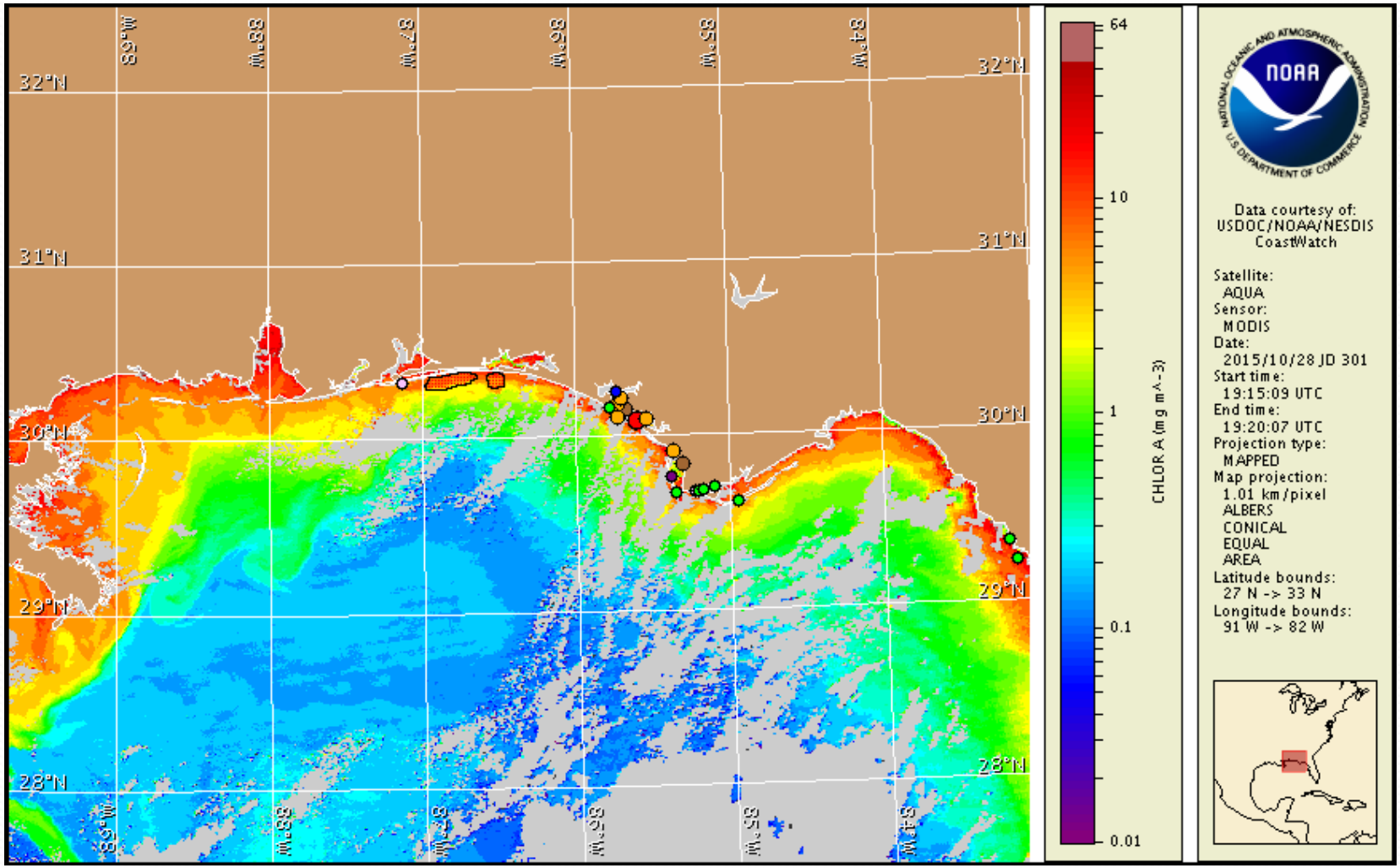
Start 7:37 AM 1/20/2016

Alabama HABs Lab

Date	Time (GMT) CST+5	Station Description	County	N Latitude	W Longitude	Total Water Depth (ft)	Water Temperature (°C)	Salinity (ppt)	Karenia cells/L	Notes
12/1/2015	14:35:00 PM	Florida Point	Baldwin	30.273	87.5509		21.3	21.8	1,000,000	
12/1/2015	14:50:00 PM	Alabama Point	Baldwin	30.2728	87.5383		22.2	28.8	14,000,000	Respiratory irritation reported
12/1/2015	14:20:00 PM	Cotton Bayou	Baldwin	30.2695	87.582		23.5	30.8	300,000	
12/1/2015	15:07:00 PM	Gulf State Park Pavilion	Baldwin	30.25472	87.64333		22.2	30.4	210,00	Respiratory irritation reported
12/1/2015	15:22:00 PM	Gulf Shores Public Beach	Baldwin	30.242	87.6761		**22.2**	30.1	620,000	
12/1/2015	16:15:00 PM	Fort Morgan Beach	Baldwin	30.2221	88.0057		22.7	29.8	8,000,000	
12/1/2015	16:45:00 PM	Bon Secour National Wildlife Refuge	Baldwin	30.1344	87.4953		22.8	30.1	5,300,000	Respiratory irritation reported
12/1/2015	15:30:00 PM	Little Lagoon	Baldwin	30.2382	87.736		21	25.9	210,000	
12/1/2015	14:50:00 PM	Dauphin Island East End	Mobile	30.2463	88.0825			12.6	Not Present	
12/1/2015	14:25:00 PM	Dauphin Island Public Beach	Mobile	30.242	88.123			19.4	440,000	

Alabama HABs- Partners NOAA



Alabama HABs Partners

- ADCNR-Marine Resources
  - Claude Peteet Mariculture Center

Alabama HABs Partners -DISL

- *Karenia brevis* bloom of 2015-2016
  - Dauphin Island Sea Lab
    - Brevetoxin research using methods that don't require mice dying
    - Analysis of shellfish and growing waters to compare toxin levels to cell counts

Alabama HABs- ADPH

- Baldwin Co HD helped with Public Health Advisory publication
- Central Office Toxicology fielded questions from the public
- The Bureau of Clinical Laboratories-Mobile Division performed microscopic exams, recorded data, and distributed results.

Alabama HABs- ADPH- Seafood

- ADPH Environmental Services- Seafood Branch
  - Responsibilities for the opening and closing of oyster growing areas.
  - Health Dept permitting of aquaculture sites.
  - Manage the ADPH response to HABs in growing waters

Alabama HABs- ADPH-Seafood

- HAB Event- Seafood Branch activities
  - Monitor three active, conditionally approved, growing areas and the two areas which are conditionally restricted or prohibited from harvest, such as, north Mobile Bay
  - When Seafood Branch environmentalists are notified that a HAB is possible, they notify Conservation-Marine Resources so that no more oysters are harvested. Marine Resources confiscates product harvested earlier in the day so that public health risk is reduced. The oysters are returned to the reef.
  - Notify FDA of the closure

Alabama HABs- ADPH

Shellfish growing waters closed
FOR IMMEDIATE RELEASE
CONTACT:
Greg Dunn(251) 662-7511
(251) 331-0409

The Alabama Department of Public Health has closed all shellfish growing waters in Mobile and
Baldwin counties. Areas I, II, III, IV, V and VI are closed. This includes Cedar Point, Portersville Bay, Grand Bay, Heron Bay, Dauphin Island Bay and Bon Secour Bay.
The order by Acting State Health Officer Dr. Thomas Miller closed harvesting as of 6 a.m. on Nov. 16, 2015.
The order is issued as a result of the presence of red tide cells (*Karenia brevis)* exceeding standards. The Alabama Department of Public Health will continue to monitor bay waters and the shellfish. Harvesting can be resumed as soon as areas meet acceptable standards.
For additional information concerning the closure, contact Greg Dunn, Alabama Department of Public Health, at (251) 662-7511 or (251) 331-0409.
11/17/15

Alabama HABs- ADPH- Seafood

- HAB Event- Seafood Branch activities
  - Seafood Branch continues to monitor the 4-5 key sites in each growing area.

Alabama HABs- ADPH- Seafood

- HAB Event- Seafood Branch activities
  - Coordinates with the lab and assesses the sampling data from other agencies' collections, such as, Florida, ADEM and ADCNR
  - Arrange for toxin testing when HAB has diminished.
  - Toxin testing using Mouse Bioassay is a specialty test performed in Florida, Maine, and Texas.
  - Growing areas are re-opened by order of the State Health Officer when toxin levels fall below FDA recommended level of 20 mouse units or the chemical levels found in the National Shellfish Sanitation Program Model Ordinance.

Alabama HABs- Future efforts

- HAB Event- Program Improvement
  - More samples of opportunity farther from shore
    - ADCNR- Marine Resources
    - Commercial fishermen
  - Improved Ocean Observing Products that predict bloom dynamics
    - Target sentinel areas that provide best predictive information for managers of beaches and shellfisheries.
    - GCOOS will work with states to improve public health protective products.
  - Flo Cyto Bot at a sentinel station-Optical Pattern Recognition

Alabama HABs- ADPH

- Credits
  - Mobile Lab Staff
  - Seafood Branch
  - Agency partners
    - ADCNR- Marine Resources- Gulf Shores and Dauphin Island
    - Dauphin Island Sea Lab
    - AL Dept of Environmental Management
  - Neighboring States
    - Mississippi Dept of Marine Resources
    - Florida Fish and Wildlife Conservation Commission

Alabama HABs- ADPH

- HAB Event- Questions?